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The Influence of Teacher Practice on Reading and Numeracy Outcomes in Kenya's Early Grades

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ABSTRACT

This article examines whether improvement in reading and numeracy in Kenyan early learning is linked through teacher practice. A structured evidence synthesis was conducted using 15 Kenya-only endline, final, or end-of-project evaluation reports published from 2015 to 2024. The grey-literature evidence base was kept separate from 12 peer-reviewed studies used to develop and interpret the conceptual argument. Numerical indicators were extracted for learner literacy or numeracy and for teacher practice, implementation, coaching, training uptake, instructional quality, or closely related classroom processes. Because the reports differed in age group, assessment instrument, intervention design, and statistical model, results were not pooled. Direct lower-primary evidence received greater inferential weight than evaluations of older primary learners and out-of-school adolescents. Across studies, structured pedagogy, coaching, aligned materials, lesson progression, and enacted classroom practice were repeatedly associated with stronger literacy or numeracy performance. However, iMlango, Sightsavers, KEEP II, and Wasichana Wetu Wafaulu also show that training, technology, or high teaching quality scores do not necessarily yield statistically significant differential learning gains. The evidence therefore supports teacher practice as a plausible common pathway, but not a simple causal claim that reading gains cause mathematics gains.

Keywords: Kenya; Early Grade learning; teacher practice; literacy; numeracy.

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1. INTRODUCTION

Foundational literacy and numeracy are mutually important dimensions of children's early educational development. In Kenya, interventions aimed at strengthening these competencies have expanded from pilot programmes to national and multi-county initiatives that combine teacher professional development, structured lesson guides, learner materials, instructional coaching, digital technologies, assessment, and school leadership support (Piper, Schroeder, & Trudell (2016). These programmes have generated a substantial grey literature evidence base, yet reading and mathematics outcomes are often reported as separate domains. This creates an analytical gap: when both domains improve, it is not immediately clear whether one skill domain is driving the other, whether the gains simply reflect maturation and schooling, or whether a shared classroom mechanism is improving both.

The question is especially important in Grades 1–3, when children shift from learning basic symbol recognition and oral language conventions toward reading connected text, solving increasingly complex number tasks, and using language to interpret mathematical problems. Reading comprehension can support understanding of written mathematics instructions, while number sense and executive-function processes draw on attention, working memory, sequencing, and persistence that are also important for literacy. Nevertheless, developmental association is not equivalent to causal transfer. A child who becomes a stronger reader may also become a stronger mathematics learner because both competencies are being supported by effective instruction rather than because reading directly causes mathematics achievement.

Teacher practice is a plausible common mechanism. Kenyan structured-pedagogy programmes commonly seek to alter what teachers do in the classroom: how lessons are sequenced, how much time learners spend actively emphasized, whether materials are used as intended, how teachers check understanding, and whether feedback or remediation follows assessment. This distinction matters because teacher training is an input, whereas instructional practice is an enacted process. A programme can train many teachers without producing sustained changes in classroom behaviour; conversely, relatively simple support can improve learning if it consistently changes how lessons are delivered.

This article therefore emphasized quantitative endline evidence rather than relying on programme descriptions. Fifteen Kenya-based endline or final evaluation reports completed between 2015 and 2024 are examined for numerical indicators of teacher practice or implementation and corresponding literacy or numeracy outcomes. Peer-reviewed Kenyan studies are reviewed separately to establish the conceptual and empirical basis for interpreting the endline evidence. The synthesis explicitly distinguishes direct foundational-learning evaluations from supporting evaluations involving older primary learners, girls with disabilities, or out-of-school adolescents, so that evidence from different populations is not treated as interchangeable.

Across Kenyan endline evaluations, simultaneous or parallel gains in foundational literacy and numeracy are expected to be more consistent when teacher professional development translates into observable, structured pedagogy, coaching and feedback, effective use of aligned materials, active learner participation, and formative assessment. Teacher practice is therefore emphasized as a common instructional pathway linking programme exposure to improvement across reading and mathematics, rather than reading improvement causing numeracy improvement, or numeracy improvement causing reading improvement.

2. LITERATURE REVIEW

2.1 Reading and numeracy as related early learning domains

Longitudinal evidence from Kenya supports the joint examination of literacy and numeracy. Platas et al. (2022) found that mathematics skills at school entry predicted subsequent mathematics and reading achievement at the end of lower primary, while early English literacy predicted later mathematics and reading achievement. Their findings indicate cross-domain developmental association after accounting for several background factors, but they do not imply that one subject mechanically causes improvement in the other. The more defensible interpretation is that the domains share cognitive, linguistic, and instructional conditions.

Language is one such condition. Piper, Schroeder, and Trudell (2016) showed that the relationships between oral reading fluency and comprehension differ across languages in Kenya’s multilingual environment. This matters for mathematics because learners must understand directions, vocabulary, and verbal representations of quantity and relationships. The implication is that weak language proficiency

can suppress measured mathematics performance even where underlying numerical knowledge is stronger, while well-sequenced language support can improve access to mathematical tasks.

2.2 Teacher professional development, coaching, and structured pedagogy

Kenyan evidence consistently suggests that teacher development is most consequential when it changes classroom instruction. Piper and Zuilkowski (2015) showed that the dosage of instructional coaching matters: lower coach workloads enabled more frequent school and classroom visits, and coaching intensity was associated with learner performance. Jukes et al. (2017) similarly reported that professional development, semi-scripted lesson plans, and continuing teacher support changed observed literacy instruction and improved learner outcomes. These studies shift the analytical focus from attendance at training events to the quality and frequency of enacted support.

The cross-domain argument is particularly well supported by Piper et al. (2018), who compared alternative combinations of professional development, coaching, pupil books, and structured teacher guides in Kenya. The package that combined teacher support with one-to-one learner materials and structured guides produced the strongest and most cost-effective overall effects on literacy and numeracy. Piper, Ralaingita, Akach, and King (2016) likewise found significant gains in mathematics from PRIMR, including procedural and conceptual outcomes. Together, these studies suggest that instructional architecture can influence both subject domains, although the magnitude of the effects varies across subtasks.

Teacher preparation remains an upstream condition. Wawire (2021) argues that early-grade reading quality depends on whether teacher preparation programmes equip teachers with the competencies required for explicit, developmentally appropriate literacy instruction. In mathematics, Barasa (2020) reports associations between teacher-quality indicators and pupil mathematics performance. These studies reinforce the proposition that subject-specific outcomes emerge partly from common features of preparation, planning, instructional clarity, and responsiveness to learners.

2.3 Technology, language, and implementation fidelity

Technology may enhance instruction, but evidence from Kenya cautions against treating it as an independent pedagogy. Piper, Zuilkowski, Kwayumba, and Strigel (2016) found that ICT-enhanced versions of an early-grade reading intervention did not produce significantly larger reading gains than the core PRIMR programme. The result is consistent with an implementation view: devices and digital content can extend opportunities for practice, but learning depends on exposure, alignment with the curriculum, teacher integration, and sufficient instructional time.

Implementation fidelity becomes more important at scale. Piper, DeStefano, Kinyanjui, and Ong'ele (2018) describe Tusome as a national-scale literacy programme built around coherent lesson materials, teacher support, and monitoring systems. Their analysis suggests that scale need not eliminate instructional quality when the programme maintains a clear pedagogical model and support structure. Similarly, Piper, Zuilkowski, Kwayumba, and Oyanga (2018) show that language-of-instruction decisions can produce secondary effects across English, Kiswahili, and mathematics, illustrating how instructional choices in one part of the curriculum may shape outcomes elsewhere.

Institutional type alone is not a sufficient explanation. Zuilkowski, Piper, and Ong'ele (2020) compared literacy and mathematics gains in Nairobi public and low-cost private schools and 47mphasized the value of examining learning growth rather than if school ownership represents instructional quality. Across this literature, the recurring mechanism is therefore not a single branded intervention. It is the conversion of training, materials, curriculum, and support into consistent classroom practice.

3. METHODS

3.1 Review design

The study used a structured quantitative narrative synthesis. Two evidence streams were maintained. First, 15 Kenya-only endline, final, or end-of-project evaluation reports formed the empirical dataset for the Findings section. Second, 12 peer-reviewed studies with valid DOI identifiers were used in the Literature Review and to interpret grey literature findings in the Discussion. Keeping the two streams separate reduced the risk of double-counting evidence from projects that were later published in academic journals.

3.2 Eligibility and selection criteria

Reports were eligible when they: (a) evaluated an intervention implemented in Kenya; (b) were completed or published between 2015 and 2024; (c) were explicitly an endline, final, impact, or end-of-project evaluation; (d) reported at least one quantitative literacy, reading, comprehension, writing, numeracy, or mathematics outcome; and € reported a teacher-practice, teacher-support, implementation, training, coaching, instructional-resource, or classroom-quality indicator relevant to the programme's learning pathway. Baseline-only studies, midlines without final outcomes, routine monitoring reports, and recurrent national learning-status surveys were excluded. Uwezo/Usawa FLANA reports and Bridge's annual EGRA/EGMA evaluations were therefore not included in the 15-report Findings corpus because they do not satisfy the strict end-of-project criterion. GEC evaluations without a comparable endline learning assessment due to COVID-19 disruptions were also excluded from the quantitative corpus.

3.3 Data sources

Table 1 presents the final data set. The first column preserves the programme name, report title, and publication year, as these are the units of evidence used in the Findings tables. Because not all eligible Kenya evaluations involve Grades 1–3, the final column distinguishes direct foundational evidence from supporting evidence. Supporting studies are used to test whether the same teacher-practice mechanism appears in other Kenyan education settings; they are not treated as Grade 1–3 effect estimate.

Table 3.1:

Data sources included in the endline evidence synthesis

Programme – report title (year)	Author	Population / design	Learning measures
PRIMR Rural Expansion – The Primary Math and Reading (PRIMR) Initiative, DFID/Kenya Rural Expansion Programme: Bungoma and Machakos Endline Study (2015)	Piper, Kwayumba, Oyanga, & Jepkemei / RTI International	Grades 1–2; rural public schools; experimental/quasi-experimental endline	EGRA and EGMA subtasks; ORF, comprehension, number skills
Open Space Literacy – Endline Survey on Open Space Literacy Project in Nairobi County, Kenya (2016)	Muyaka, Wawire, Otieno, & Mandela / WERK	Standards 2–4; intervention and comparison schools	English EGRA-style letter/sound and reading outcomes
iMlango – iMlango Endline Evaluation Report, Phase I (2017)	iMlango consortium / independent evaluation	Primary schools in Kajiado, Kilifi, Makueni, Uasin Gishu; high attrition at endline	Literacy and numeracy assessments; digital-learning exposure
Wasichana Wote Wasome – Step Change Window Endline Evaluation, Kenya (2017)	Education Development Trust / GEC Evaluation Manager	Marginalised girls in primary schools across ASALs and urban slums	Literacy and numeracy outcomes
Closing the Gap – Inclusive Education for Girls with Disabilities in Kenya, Endline (2017)	Leonard Cheshire Disability / GEC	Girls with disabilities in intervention and control schools	English literacy, Kiswahili literacy, numeracy proficiency levels

Programme – report title (year)	Author	Population / design	Learning measures
Tayari – Impact Evaluation of Tayari School Readiness Program in Kenya: Endline Report (2018)	Ngware et al. / APHRC	Pre-primary children in public and APBET centres; multi-arm impact evaluation	Early literacy and early numeracy school-readiness measures
KNEC EGMA – Early Grade Mathematics Assessment Endline Study (2020)	Kenya National Examinations Council	Grade 2 learners and mathematics teachers; national endline assessment	EGMA number identification, operations, patterns, problem solving
Tusome – Tusome ("Let's Read") External Evaluation: Endline Report, revised final (2021)	Keaveney, Fierros, Rigaux, & Menendez / NORC	Grades 1–2; national structured literacy programme	English/Kiswahili ORF, comprehension, benchmarks
Inclusive Education in Kenya's Lake Region – Endline Evaluation Report (2022)	One South, LLC / Leonard Cheshire	Girls with disabilities; upper primary/secondary transition cohorts	English literacy/ORF and numeracy scores
KEEP II – Kenya Equity in Education Project, Phase II: Endline Evaluation, Final Report (2022)	Rothman & Rioux / C.A.C. International	Refugee and host-community girls; upper-primary/secondary cohorts	Literacy and numeracy average scores/benchmarks
Education for Life – Endline Evaluation Report (2022)	Women Educational Researchers of Kenya (WERK)	5,701 out-of-school girls aged 10–19; catch-up centres	Kiswahili, English and mathematics; reading/ORF/comprehension subtasks
Wasichana Wetu Wafaulu – Endline Evaluation (2023)	Madden, Geitner, Alvarez Camps, & Wicaksano / Consilient	Marginalised girls in primary/secondary/ TVET settings	SeGRA literacy and SeGMA numeracy calibrated scores
Sightsavers ECDE – Impact Evaluation of an Inclusive Early Childhood Development and Education Intervention in Kenya: Endline Report (2024)	Muuo, Jeyam, de Kadt, & Schmidt	Public pre-primary centres in Homa Bay and Kakuma; intervention/comparison	Literacy and numeracy composite scores
Play Accelerator – LEGO Foundation Play Accelerator: Kenya Endline Report (2024)	Jordan et al. / RTI International	Longitudinal cohort; Grade 3 classroom observations and later learner endline	EGRA English and EGMA mathematics tasks
World Vision Kenya – Impact Evaluation Report, World Vision Kenya 2016–2022 (2024)	World Vision Kenya / independent evaluation	Children across Area Programmes including ECD and primary	Reading with comprehension; education indicators

Note. EGRA = Early Grade Reading Assessment; EGMA = Early Grade Mathematics Assessment; ORF = oral reading fluency; APBET = Alternative Provision of Basic Education and Training. "Direct foundational" indicates evidence closest to the target early-grade population; supporting evaluations are not interpreted as Grade 1–3 estimates.

3.4 Data extraction and coding

For each report, the extraction captured the programme, publication year, population, design, assessment domain, teacher practice or implementation metric, and numerical learner result. Numerical statistics were preserved in their original metric rather than converted to a common scale. Accordingly, the tables report percentages, percentage-point changes, means, standard deviations, correct words or letters per minute, effect sizes in standard deviations, p-values, confidence intervals, regression coefficients, or difference-in-differences estimates where supplied by the source report.

Teacher practice was coded more narrowly than programme participation. Direct practice indicators included observed instructional method, use of teaching aids or guides, pacing, feedback, learner participation, teacher absenteeism, and individualized support. Implementation indicators such as training uptake, coaching visits, or use of digital tools were retained when direct observation was unavailable, but interpreted as weaker evidence because exposure does not prove enactment.

3.5 Evidence weighting and synthesis

No statistical meta-analysis was attempted because the evaluations differ in age group, outcome instrument, scale construction, follow-up period, and causal design. Instead, a direction-and-strength synthesis was used. Greater weight was assigned to evaluations that: (1) involved pre-primary or Grades 1–3; (2) measured teacher practice and learner outcomes in the same evaluation; (3) included a comparison group or multivariable model; and (4) reported uncertainty through p-values or confidence intervals. Before–after programme results, teacher self-reports, and bundled interventions were retained but interpreted cautiously. Three Findings tables contain all 15 reports exactly once so that the complete evidence base can be audited.

4. FINDINGS

4.1 Direct foundational and lower-primary evidence

The most direct evidence indicates that structured instructional support can generate measurable gains in literacy and mathematics, but effects vary by domain and by the extent to which teacher practice is enacted. PRIMR provides the clearest cross-domain example because the same instructional architecture was applied to reading and mathematics. Tayari similarly demonstrates parallel school-readiness effects, while KNEC EGMA shows improving Grade 2 mathematics alongside widespread use of conventional and practical teaching methods. Tusome provides strong literacy-specific evidence that lesson progression and instructional fidelity are associated with oral reading fluency. Open Space Literacy provides a smaller Nairobi example in which teacher uptake of digital and non-digital materials coincided with higher lower-primary reading performance.

Table 4.1:

Direct foundational/lower-primary evidence: quantified teacher practice and learning outcomes

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
PRIMR Rural Expansion – Bungoma and Machakos Endline Study (2015)	Grades 1–2; treatment vs control; EGRA/EGMA	PRIMR tutors reported 24.6 school visits and 41.0 classroom visits in the previous month versus 9.2 and 9.2 among control/TAC tutors. Each additional classroom visit was associated with ≈ +1 English CWPM, controlling for treatment.	English/Kiswahili EGRA; EGMA procedural/conceptual tasks	English letter-sound treatment mean ≈47.0 CLPM vs 25.7 control; Class 1 comprehension 21.1% vs 9.8%. Overall English reading effect ≈0.63 SD. Mathematics effect ≈0.16 SD (Class 1) and 0.26 SD (Class 2), with number identification ≈0.27 SD and missing-number ≈0.29 SD. Interpretation: the same structured support produced positive effects in both domains, and coaching dosage independently tracked ORF.

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
Open Space Literacy – Endline Survey on Open Space Literacy Project in Nairobi County, Kenya (2016)	Standards 2–4; intervention n≈942 vs control n≈238 for reported English measure	About 75.0% of male and 72.5% of female teachers in intervention schools used digital/non-digital materials; ≈63% were trained in digital monitoring of learner progress and ≈57% used learner-centred digital materials.	English letter/sound/reading fluency-type outcome	Overall intervention M=41.44 correct items/min (SD=21.66) vs control M=36.63 (SD=21.74). Standard 2: intervention M=39.74 (SD=19.91; n=297) vs control M=32.15 (SD=16.35; n=65). Interpretation: higher teacher material uptake coincided with a 4.81-unit overall mean advantage, but the endline design does not establish mediation.
Tayari – Impact Evaluation of Tayari School Readiness Program in Kenya: Endline Report (2018)	Pre-primary; multi-arm impact evaluation in public/APBET centres	Teacher training plus classroom instructional support formed the core intervention. Classroom observation found at least ≈12% of teacher actions off-task across study groups; ≈85% of teachers identified improved pupil learning and ≈73% improved teacher performance as programme objectives.	Early literacy and numeracy school-readiness indices	Combined public/APBET standardized effects: literacy T1=0.58 SD, T2=0.63 SD, T3=0.63 SD; numeracy T1=0.22 SD, T2=0.43 SD, T3=0.40 SD. Interpretation: positive parallel domain effects, with larger literacy than numeracy effects; adding aligned materials strengthened numeracy relative to training/support alone.
KNEC EGMA – Early Grade Mathematics Assessment Endline Study (2020)	Grade 2 national endline; mathematics teachers and learners	Teachers reporting "always": individual assignments 84.6%, pupils volunteering answers	Grade 2 EGMA benchmark and subtasks	Learners attaining ≥50% benchmark increased from 71.1% at baseline to 76.1% at endline (+5.0 pp). Among learners with special educational needs, subtraction improved from 15.8% to 54.4% (+38.6 pp) and number patterns from 36.5% to 45.9%

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
		82.7%, practical activities 60.1%; group assignments 32.8% always +46.3% often. Lesson plans were used "always" by 87.5%; course books by 95.8%.		(+9.4 pp). Interpretation: numeracy improved in a context of high reported instructional-resource use, but the national before–after design is descriptive rather than causal.
Tusome – Tusome ("Let's Read") External Evaluation: Endline Report, revised final (2021)	Grades 1–2; national structured literacy programme	Observed use of the Direct Instruction Model declined from ≈90% at midline to 84% at endline; adequate pacing 94%→89%; encouraging feedback 92%→89%; remediation 93%→88%. A 10-lesson advance in teacher-guide progression was associated with ≈+1 English CWPM.	English/Kiswahili ORF and comprehension benchmarks	At endline ≈14% of Grade 1 pupils met the English fluent threshold (≥35 CWPM) and ≈18% of Grade 2 met ≥65 CWPM; Kiswahili fluent-threshold attainment was <8% in both grades. Reading stories at home/reading aloud at school was associated with ≈+3 to +6 CWPM, while local-language use during English instruction was associated with ≈−7 to −12 CWPM. Interpretation: lesson progression and language/reading practices were quantitatively related to fluency, although benchmark attainment remained low.

4.2 Technology, inclusion, and longitudinal implementation evidence

The second group demonstrates why implementation measures must be interpreted alongside learning outcomes. iMlango generated high levels of teacher acceptance of digital tools and self-reported learner gains, yet its causal estimates were imprecise and statistically non-significant due to weak exposure and sample retention. By contrast, the Leonard Cheshire Lake Region evaluation produced direct statistical associations between individualized teacher support and literacy improvement. Sightsavers' ECDE evaluation is an important null case: both intervention and control groups improved markedly, but adjusted intervention effects were not statistically significant. The 2024 Play Accelerator shows the opposite pattern for at least one literacy outcome: teacher training in learning through play increased sharply and Phase 2 reading-comprehension gains exceeded control gains significantly.

Table 4.2:

Technology, inclusion, and longitudinal evidence: quantified practice and learner outcomes

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
iMlango – iMlango Endline Evaluation Report, Phase I (2017)	205 primary schools; endline cohort affected by high attrition	At baseline 50% of 266 interviewed teachers reported no ICT skills. At endline, 84.4% of intervention teachers said digital learning tools made teaching easier. Personalized mathematics exposure in one group averaged only ≈9 min/week.	Literacy and numeracy assessment / digital learning exposure	Girls reported new learning in numeracy (85.5%) and literacy (76.2%). Estimated numeracy effects were non-significant: Group A β≈0.16 SD, p=.29; Group B β≈0.04 SD, p=.82; Group C β≈−0.09 SD, p=.63. In one literacy exposure model, R^2≈13.2%, p<.001; another was R^2≈0.1%, p=.469. Interpretation: high teacher acceptance did not translate into robust average causal effects under low/uneven dosage and attrition.
Closing the Gap – Inclusive Education for Girls with Disabilities in Kenya, Endline (2017)	Girls with disabilities in intervention and comparison schools	The project trained/support-ed teachers in inclusive pedagogy across 50 project schools; 672 teachers were reported as trained across the programme.	Highest proficiency level in English literacy, Kiswahili literacy, and numeracy	Highest-level attainment: English 40% intervention vs 20% control (+20 pp); Kiswahili 44% vs 19% (+25 pp); numeracy 66% vs 42% (+24 pp). Interpretation: large cross-domain gaps favour intervention schools, consistent with an inclusive-teaching pathway, although the bundled programme does not isolate the independent teacher effect.
Inclusive Education in Kenya's Lake Region – Endline Evaluation Report (2022)	Girls with disabilities; broader primary/secon dary cohorts	Girls reporting that teachers supported their learning needs increased from 68.9% baseline to 85.7% midline and 90.3% endline (+21.4 pp from baseline). Individualized teacher support was tested statistically against learning change.	English literacy/ORF and numeracy	Aggregate literacy improved ≈+10% baseline→midline and +7% midline→endline; numeracy ≈+16% then +8%. Girls whose teachers addressed individual learning needs averaged ≈+13 percentage points in English literacy improvement; reported model R^2≈.55, F≈13, p<.001. Ease of asking teachers for help was associated with ≈+24 ORF words/min (R^2≈.046, F≈11, p=.001). Interpretation: among the reviewed endlines, this is unusually direct evidence linking a teacher-practice variable to literacy change.
Sightsavers ECDE – Impact Evaluation of an Inclusive Early Childhood	Public pre-primary centres; intervention/co mparison in Homa Bay and Kakuma	Continuous professional guidance was delivered through school-based inclusion teams; 9 intervention public pre-primary centres were included	Literacy and numeracy composite scores	Homa Bay literacy: control median 36 [IQR 26–48]→63 [48–74], change 24 [14–35]; intervention 37 [26–50]→60 [47–71], change 21 [12–31]. Adjusted intervention effect −3.03 (95% CI −6.41, 0.34), not

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
Development and Education Intervention in Kenya: Endline Report (2024)		in the implementation structure.		significant. Homa Bay numeracy changed 39→64 control and 39→65 intervention; adjusted effect was not statistically significant. Interpretation: substantial maturation/learning occurred in both groups, but additional programme impact was not demonstrated.
Play Accelerator – LEGO Foundation Play Accelerator: Kenya Endline Report (2024)	Longitudinal cohort; Grade 3 classroom observation with later learner endline; control/Phase 1/Phase 2 schools	Learning-through-Play-specific teacher training in Phase 2 increased from 12.0% to 78.7% (+66.7 pp); control rose 8.2%→19.1%. Phase 2 vs control training impact ≈+55.7 pp, p<.05. About 98% of Phase 2 teachers said play made their job easier.	English EGRA and mathematics tasks	Phase 2 ORF increased 4.4→35.2 CWPM (+30.8). English reading comprehension increased 4.2%→31.8% (+27.6 pp); control 0.9%→23.6% (+22.7 pp), giving Phase 2 vs control differential ≈+5.3 pp, p<.05. Invented-word fluency increased 6.9→25.0 CWPM (+18.1). Interpretation: large training uptake coincided with a statistically significant incremental comprehension gain, although not all literacy/numeracy comparisons were significant.

4.3 Broader Kenyan endlines and counterevidence

The third group extends the mechanism beyond the direct early-grade population and, importantly, supplies counter-evidence. Wasichana Wote Wasome combined high reported teacher uptake with stronger numeracy growth in intervention schools. Education for Life recorded very high learner ratings for teacher explanations and the use of teaching aids, alongside statistically significant gains in literacy and mathematics in catch-up cohorts. However, KEEP II gains were small, and Wasichana Wetu Wafaulu had a high teaching-quality score while its difference-in-differences estimates for literacy and numeracy were not statistically significant. World Vision reported a large increase in reading comprehension, but the teacher-training contribution was inseparable from materials, infrastructure, attendance, and wider programme components. These studies show that the common-pathway claim is strongest when teacher practice is observed, adequately dosed, and analytically linked to learning rather than merely present in the intervention package.

Table 4.3:

Broader Kenyan endline evidence and counterevidence: quantified practice and learner outcomes

Programme – report title (year)	Population / analysis	Teacher's practice	Learner outcome measured	Numerical result and scientific interpretation
Wasichana Wote Wasome – Step Change Window Endline Evaluation, Kenya (2017)	Marginalised primary-school girls in ASALs/urban slums	More than 2,500 teachers were trained in literacy/numeracy and 88% reportedly applied the approaches/materials provided by the project.	Literacy and numeracy outcomes	Mean numeracy mark improved ≈7% in intervention schools versus ≈4% in comparison schools, a +3 pp differential. Among girls initially fluent readers with limited comprehension, endline performance reached about 3 of 5 comprehension questions. Interpretation: high reported teacher uptake accompanies a modest relative numeracy advantage, but individual teacher-practice mediation was not estimated.
KEEP II – Kenya Equity in Education Project, Phase II: Endline Evaluation, Final Report (2022)	Refugee and host-community girls; broader grade range	Teacher training/coaching and gender-responsive practice were core components, but transfer was uneven; at endline ≈22% of girls still reported differential treatment of boys and girls by teachers.	Grade-5-equivalent literacy and numeracy average scores	Modified-panel literacy mean 44.6%→49.2% (+4.6 pp), significant at p<.01; numeracy 33.6%→36.0% (+2.4 pp), p<.001. Established literacy learners rose 47%→56% (reported +8 pp). Interpretation: statistically significant but small mean gains occurred despite incomplete translation of teacher training into equitable practice.
Education for Life – Endline Evaluation Report (2022)	5,701 out-of-school girls aged 10–19; catch-up cohorts	Observed teacher sensitive-attitudes score=3.83/4. Girls agreeing: teacher made them welcome 98.2%, used teaching aids 98.0%, explained lessons well 98.4%, responded to questions well 98.8%; 29.6% reported teachers often absent.	Kiswahili, English and mathematics plus reading subtasks	Cohort 1 Kiswahili 17.61%→32.14%, change +14.53 pp, p<.001; mathematics 21.98%→38.34%, +16.36 pp, p<.001. Cohort 3 mathematics 39.58%→47.89%, +8.31 pp, p<.001; Kiswahili +7.25 pp, p=.001. Cohort 3 reading words +7.9 pp, ORF +5.4 pp, comprehension +8.5 pp. Interpretation: strong teaching ratings coexist with significant learning gains, but no comparison-group mediation test was conducted.
Wasichana Wetu Wafaulu – Endline	Marginalised girls; intervention/comparison, post-	Endline Teaching Quality Score=83.4/100; classroom-	SeGRA literacy and SeGMA numeracy	Literacy: intervention 54.8→48.2 (−6.7 pp) vs comparison 50.1→39.5 (−10.6 pp); DiD=+4.3 pp, p=.26.

Evaluation (2023)	COVID	observation subscore=84.4; instruction=82.4; classroom culture=97.0. Learner-rated learning environment improved 67.3→76.0 (+8.7 pp).	calibrated scores	Numeracy: intervention 34.2→41.1 (+7.0 pp) vs comparison 28.2→33.0 (+4.8 pp); DiD=+2.2 pp, p=.46. Interpretation: high observed teaching quality did not yield statistically significant differential learning effects, providing direct counterevidence to a simplistic training/quality → learning assumption.
World Vision Kenya – Impact Evaluation Report, World Vision Kenya 2016–2022 (2024)	Area Programmes including ECD and primary; programme-level impact evaluation	Education package included in-service teacher training, reading materials and school-environment improvements. The report does not provide a separable percentage for teacher-practice uptake in the cited learning result.	Reading with comprehension	In the Lokis evaluation, children able to read with comprehension increased from 21.0% to 59.4%, a +38.4 pp change. Interpretation: a large literacy improvement occurred within a bundled quality-education package, but the independent contribution of teacher training cannot be estimated from this result.

4.4 Synthesis of the quantitative pattern

Across the 15 reports, three patterns are evident. First, the strongest direct foundational studies show positive learning change when programmes combine structured pedagogy with sustained teacher support. PRIMR produced positive standardized effects in both reading and mathematics, and additional coaching visits independently predicted English fluency. Tayari produced sizeable literacy effects of approximately 0.58–0.63 SD and smaller but positive numeracy effects of 0.22–0.43 SD. These are consistent with a shared instructional pathway, while also showing that the magnitude of response can differ by subject.

Second, implementation dosage matters. In Tusome, teacher-guide progression was quantitatively associated with oral reading fluency. In Play Accelerator Phase 2, learning-through-play training rose by 66.7 percentage points, and the reading-comprehension improvement exceeded control by approximately 5.3 percentage points ($p<.05$). In iMlango, however, 84.4% of teachers viewed digital tools positively while average numeracy treatment estimates remained non-significant and one personalized-learning group averaged only about nine minutes of weekly mathematics exposure. This divergence suggests that acceptance of an innovation is not equivalent to sufficient instructional dosage.

Third, the evidence contains informative null and mixed findings. The Sightsavers ECDE intervention did not yield a statistically significant adjusted literacy advantage in Homa Bay, despite large improvements in both the intervention and control groups. Wasichana Wetu Wafaulu recorded an 83.4/100 teaching-quality score, yet its literacy and numeracy difference-in-differences estimates were $p=.26$ and $p=.46$, respectively. KEEP II generated statistically significant but small mean gains. These results qualify the central claim: teacher practice is a plausible common pathway, but teacher training, perceived quality, or programme participation alone is insufficient to guarantee differential learning effects.

5. DISCUSSION

5.1 Teacher's practice as a predictor

The evidence supports the proposed claim in a qualified form. The most persuasive studies are those that connect a measurable instructional process with learner performance. PRIMR is central because its programme architecture covered literacy and numeracy and because coaching dosage was associated with English oral reading fluency in addition to treatment effects across EGRA and EGMA. Tayari adds evidence that the same broad teacher-support architecture can generate positive standardized effects in early literacy and numeracy before or at entry to formal primary school. These results are consistent with the peer-reviewed finding of Piper et al. (2018) that professional development is more effective when combined with aligned learner books and structured guides.

The mechanism is not simply 'better teachers'. Rather, the evidence points to specific behaviours and conditions: teachers progressing through the intended lesson sequence; using aligned materials; creating opportunities for active pupil response; providing feedback and remediation; adapting instruction to individual learning needs; and sustaining sufficient time on task. The Lake Region inclusive-education evaluation is especially important because individualized teacher support was statistically associated with literacy improvement, with girls whose teachers addressed learning needs showing approximately a 13 percentage-point greater improvement in English in the reported analysis. This moves beyond an intervention-versus-control comparison toward a test of a hypothesised instructional process.

5.2 Why literacy and numeracy may move together

The findings do not justify a claim that literacy gains cause mathematics gains. Platas et al. (2022) provide a better framework: early reading and mathematics predict later achievement across domains, which suggests shared developmental resources and reciprocal access to instruction. In classrooms, both reading, and mathematics depend on language comprehension, attention, symbolic processing, opportunities for guided practice, corrective feedback, and the teacher's ability to diagnose misconceptions. A teacher who improves lesson structure and formative assessment may therefore improve both domains without one subject mediating the other.

This interpretation also explains asymmetric effects. Tayari's literacy effects were larger than its numeracy effects, while iMlango's programme narrative reported stronger progress in numeracy than literacy. Subject-specific content and dosage still matter. A shared instructional architecture does not eliminate differences in curriculum, language demands, assessment sensitivity, or the amount of practice required for mastery. The common-pathway hypothesis should therefore be understood as partial rather than exclusive: teacher practice can influence both domains, while subject-specific pedagogy continues to determine the size and form of the effect.

5.3 Training, technology, and fidelity

The mixed studies demonstrate why training attendance should not be used as a proxy for teaching quality. Wasichana Wote Wasome reported that 88% of trained teachers applied programme approaches and materials, and that there was a modest intervention advantage in numeracy. Education for Life reported very high learner ratings of explanations, teaching aids, and teacher responsiveness alongside significant learning gains. In contrast, Wasichana Wetu Wafaulu achieved a high observed teaching-quality score but did not produce statistically significant differential learning gains. The implication is that teacher practice must be sufficiently aligned to the assessed skills, sustained over time, and delivered in conditions that allow learners to benefit.

Technology follows the same rule. The iMlango endline demonstrates high teacher acceptance but weak or imprecise average causal estimates under low exposure and attrition. This is consistent with Piper, Zuilkowski, Kwayumba, and Strigel (2016), who found that adding ICT to PRIMR did not automatically outperform the core structured programme. Digital tools can increase practice and feedback, but they are mechanisms for delivering instruction, not substitutes for instructional coherence.

5.4 Implications for Kenyan foundational-learning policy and evaluation

For policy, the synthesis suggests that literacy and numeracy improvement should not be designed as two entirely separate reform agendas. Common investments in instructional coaching, clear lesson routines, aligned learner materials, formative assessment, and teacher use of evidence can serve both domains. Subject-specific guidance remains necessary, but the implementation platform can be shared. This is particularly relevant in competency-based education, where teachers are expected to integrate communication, problem-solving, and learner participation across subjects.

For evaluation, future Kenyan studies should measure reading, numeracy, and teacher practice in the same longitudinal Grade 1 cohort through Grade 3. Repeated classroom observations should accompany EGRA and EGMA at baseline and endline. A pre-specified teacher-practice index could include lesson sequencing, active learner time, formative questioning, feedback, differentiation, use of guides/materials, and instructional language. Multilevel mediation models could then test whether programme assignment predicts change in teacher practice and whether that change, in turn, predicts change in both reading and mathematics. This would provide a stronger test of the common-pathway hypothesis than the currently available heterogeneous endline evidence.

5.5 Limitations

Only a subset of the 15 reports directly covers pre-primary or Grades 1–3 and measures both literacy and numeracy. The supporting GEC studies involve older primary learners, adolescents, refugees, or girls with disabilities and therefore test the generality of the mechanism rather than the early-grade effect size. Second, assessment instruments vary substantially, including EGRA, EGMA, SeGRA, SeGMA, project-specific school-readiness scales, and functional literacy/numeracy tests. Third, teacher measures range from direct observation to self-report and training exposure. Fourth, many programmes bundle teacher development with books, technology, infrastructure, attendance support, cash transfers, or community interventions, limiting attribution. Finally, COVID-19 disrupted learning trajectories and endline comparability in several projects. The synthesis therefore evaluates consistency and plausibility, not a pooled causal effect.

6. CONCLUSION

The claim is supported, but only in a qualified scientific sense. Across Kenya's 2015–2024 endline evidence, the programmes showing the clearest gains in foundational literacy or numeracy commonly include sustained efforts to alter classroom instruction through coaching, structured lesson guides, aligned materials, active participation, formative feedback, individualized support, or other enacted practices. PRIMR and Tayari provide the strongest cross-domain early-learning evidence; Tusome shows a quantitative relationship between implementation progression and oral reading fluency; the Lake Region evaluation links individualized teacher support to literacy change; and Play Accelerator links a large increase in teacher training uptake to a statistically significant incremental gain in reading comprehension.

At the same time, the claim is not universally supported. iMlango's teacher acceptance did not yield statistically significant average numeracy effects, Sightsavers' adjusted ECDE literacy effect crossed zero, and Wasichana Wetu Wafaulu combined high teaching-quality scores with non-significant literacy and numeracy difference-in-differences. These counter-results are analytically important. They indicate that teacher practice must be enacted, sufficiently intensive, aligned to the learner outcome, and measured directly; training or programme membership alone is not enough.

The evidence therefore supports teacher practice as a common instructional pathway through which Kenyan programmes can improve reading and mathematics, while rejecting a simplistic claim that progress in one subject causes progress in the other. A stronger next generation of research should follow the same Grade 1–3 learners, administer both EGRA and EGMA, observe teachers repeatedly, and formally test mediation. Such designs would convert the plausible mechanism identified in this synthesis into a directly testable causal model for foundational-learning improvement in Kenya.

DECLARATION

Conflict of interest

The author declares no conflict of interest of any form regarding this work, and is, thus, his (own) original work done independently.

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